

Harnessing Light for Medicine:

Creating New Biophotonics Tools for Doctors

California Science Content Standards

The Science Standards for Grades Six through 12 that pertain to the subject matter for this Science on Saturday presentation have been summarized here for use by teachers. The numbering and lettering that are used in the [California State Science Standards](#) have been preserved in order that teachers can refer to them in context.

Grade Six

Heat (Thermal Energy) (Physical Science)

3. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. As a basis for understanding this concept:

a. Students know energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects.

Grade Seven

Structure and Function in Living Systems

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:

b. Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.

Physical Principles in Living Systems (Physical Science)

Physical principles underlie biological structures and functions. As a basis for understanding this concept:

a. Students know visible light is a small band within a very broad electromagnetic spectrum.

b. Students know that for an object to be seen, light emitted by or scattered from it must be detected by the eye.

e. Students know that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.

f. Students know light can be reflected, refracted, transmitted, and absorbed by matter.

Grades Nine Through Twelve

Physics

Heat and Thermodynamics

3. Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat. As a basis for understanding this concept:

- a. Students know heat flow and work are two forms of energy transfer between systems.

Waves

4. Waves have characteristic properties that do not depend on the type of wave. As a basis for understanding this concept:

- a. Students know waves carry energy from one place to another.

Grades Nine Through Twelve

Biology/Life Sciences

9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:

- a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.

10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:

- b. Students know the role of antibodies in the body's response to infection.